INTELLOFAX 21

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28 Jul 53

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25X1A2g

[redacted]

COUNTRY: Europe

SUBJECT: European Electric Power Supply/Need for Power in Western Europe

DATE ACQUIRED: [redacted] 25X1A

DATE OF INFO : to July 53

25X1X6

SOURCE [redacted]

25X1X6

Available on loan from CIA Library is a report, [redacted] which covers the following:

(A) The European Electric Power Supply and the Need for Power in Western Europe,

(B) Austrian Hydropower,

(C) The Yugoslav Hydropower in the Western European Power Grid,

(D) The Countries Behind the Iron Curtain.

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AUSTRIAN HYDROPOWER IN THE WESTERN EUROPE POWER GRID

The steadily growing demand for electrical power brought large national high tension transmission line systems in the 1920's to the European countries. This was a relatively easy development in Switzerland, which has a small territory, a large demand for electrical power and an abundant supply of hydropower. Sweden had a development similar to that of Switzerland, the only difference being that Switzerland with its small territory was not confronted with the necessity of constructing long transmission lines. Five sixths of the population of Sweden is concentrated in the central and southern part of the country while, five-sixths of its hydropower is in the northern part. However the national high tension grid is built for their own use, and it cannot be taken in consideration for Central European cooperation. Norway, with the largest hydro possibilities in Europe could technically and economically serve on a sound basis Denmark and also part of Germany. France had, prior to the war, a national transmission line system of 150 KV and 220 KV combining the thermal power of North-France with the hydro plants in the Alps and in the Pyrenees.

Fifty percent of the total energy production in Europe is from hydroplants. In Germany, the hydroproduction is only 18% of the total electrical power production. This was the reason why Germany looked early for hydro power supply from other countries. Italy, being poor in coal, was also particularly interested in hydropower, In 1930 Italy had 736,000 KW; in 1952 they had 970,000 KW thermal power plants including the geothermical plants:

Hydroplants: In 1930 Italy had 3,717,000 KW; in 1952 they had 7,500,000 KW. Italy has developed 52% of its hydraulic potentials. The rest cannot be built economically.

Austria is the power source to which all European countries are looking. Here are the main statistical data:

	In Million KWH		
	1937	1946	1951
Production of hydropower	2,389	3,148	5,660
Production of Thermalpower	501	655	1,640
Domestic consumption (inc.homes)	1,375	2,304	4,850
Export	413	764	860

The Austrian part of the Alpine water-power, worthy of development, is estimated to be 30 billion KWH yearly. From this 8 billion is developed or under construction; and general projects exist for 24 billion KWH.

The power-hunger in Europe brought cooperation amongst European countries after the First World War. Germany came to Austria in 1922. RWE founded with Land-Vorarlberg the VORARLBERGER ILLWERKE, which now has a built capacity of 323,000 KW, with an additional 312,000 KW in projects. An inter-European 220 KV grid was planned, and many engineers, and idealists have seen in this power-cooperation the start of a European union.

The Second World War, and the political situation, which resulted from it created a free Western Europe, and an enslaved Eastern Europe behind the Iron Curtain which changed this plan. It didn't stop it, it changed only the free world which is now interested only in the development of Western Europe.

If, in the near future, Eastern Europe gets its real freedom with equal rights with the Western members of the European family: than the whole European grid program will have to be changed in order to include this important territory of Eastern Europe with approximately 120 million people which is as important to power production, as it is to power consumption. However, for the time being, it is only a dream, and therefore let us be realistic and discuss only the territory of free Western Europe.

The year 1945 found Western Europe faced with a catastrophic power shortage. Many power plants had been destroyed and no new power plants had been constructed to meet the normal increase in the demand for power. All this contributed to the cooperation of the Western European countries. As early as the autumn of 1945 a "Public Utilities Panel" was founded to promote European cooperation. This first body had as members: France, the Benelux Countries, Switzerland and the Occupation Authorities of Germany. Soon thereafter Austria and Italy were also included. This panel was attached to the "Emergency Economic Comission for Europe" with headquarters in London.

As an example of this increased cooperation, Switzerland supplied their summer surplus power in 1946 to Germany in order to get reciprocal energy for the following winter, when serious coal shortages existed.

With existing technical knowledge and means, a future development of the national electricity economy in any of the European countries without consideration of the neighboring countries, is no longer conceivable.

General recognition of this fact resulted in the founding of a Committee for Electric Energy within the European Economy Comission of UNO at Geneva, Switzerland. The committee has permanent members for thermal and hydro power production and power transmission. Members of the committees are delegates of the competent governments and the power companies. They study all problems of the European power economy and they especially recommend the construction of such power plants, which from all European angles, will give the most rational solution. In this committee are represented the Benelux Countries, France, Italy, Austria, Switzerland, England, Scandinavia, Portugal, Greece and Yugoslavia.

Problems handled by this committee are:

Steampowerplants in browncoal territories; firing waste in blackcoal mines; comparison of the transport of coal by rail or water with the power transmission of high tension lines from coal basins to user centers; the economy of storage pumping stations in cooperation with steam powerplants or hydroplants on rivers; agreements on hydroplants on rivers; agreements on hydroplants at rivers location which are boundaries between countries. The committee is also in contact with the International Standard Committee to establish the standard unit sizes for uniformity in production which means shorter deliveries.

To avoid duplication of effort, the Union Internationale Des Producteurs Et Distributeurs D'Energie Electrique (Unipede) the Conference Internationale des Grands Reseaux Electriques a Haute Tension (Cigre), and the World Power Commission have their observers at Geneva. This committee handles long range problems.

The urgent problems for immediate needs are handled by the Electric-Committee of the OECE in Paris. The participating sixteen countries made a survey which showed that from 1947 to 1952 there was a demand for power increase of 20 million KW. The countries have the necessary financial means for 15 million KW; for the balance of 5 million KW, they have looked to the U.S.A. for financial help. This 5 million KW is 6 to 7% of the planned Western European capacity of 70 million KW by 1952. As the program of ECA was planned only till 1952, no long range projects could be included. The ECA had in their original program a credit for 3 years for 450 million dollars, from which approximately 10% would be utilized for power plants in a total of 1 million KW.

Norway, Sweden, and Denmark have a project for supply of hydropower to Denmark. They expect also U.S.A. help.

As long as U.S.A. was so generous with the UNRRA, the Marshall Plan, and the ECA, the Europeans were more ambitious in their programs.

Studies of the Electro Economy are particularly delicate. The variety of technical aspects often leads to wrong conclusions. Economical analysis often ignore all technical considerations; and technically sound plans may result in economically unsound investments.

Such unsound decisions probably were made in the immediate postwar period.

Now, when the Europeans have more and more to use their own money more and more and no longer receive such lavish assistance, unparalleled in all of history, from the U.S.A., they are more careful about their programs.

Inter-European cooperation has the sound basis of cooperation of the steam and hydro systems. As known, the large thermal plants operate rational on a day and night operation. The operation expenses for the needed power for the night overload are small. It is always more economical, if possible, for this overload to use the existing thermal power surplus instead of storage water power.

There exists also the supplementary cooperation between the powerplants in the glacier rich high Alps, the glacier free lower Alps, and those of the central French mountains. As a result of this more careful consideration of all technical and economical angles, the value of Austrian hydropower development became clearly apparent.

AUSTRIA

Before we start the description of the details of the Austrian hydro development as such, a short review of Austria itself may be helpful and appropriate.

Austria, has an area of 32,369 square miles and approximately 7 million population. It stretches on its long East West axis from the border of Hungary in the East and Yugoslavia in the South East, to within 100 miles of the French-Swiss frontier. About 73% of the country is mountainous (Eastern Alps). The winter lasts from two to three months in the valleys and from five to seven months in the mountains. The eastern provinces which account for three fourths of Austria's arable land are mainly under Russian occupation.

Until 1918 Austria was the political center of the Austrian-Hungarian Monarchy of approximately 40 million population.

It also received the main part of the tax, as well as other government incomes. After 1918 Austria was detached from all other parts of the Monarchy, with one third of its population in Vienna, and it had to take over the largest part of the Government officials, who had ruled over 20 million people. This forced Austria to develop their agriculture to achieve self-sufficiency in food. In 1938, just before Germany occupied Austria, the domestic food production was 75% of the requirements. However, Austria still imported large quantities of Foodstuff from the Balkans. In 1946 the agriculture production was only 50% of that of 1938. Now Austria is again producing 70 to 80% of their food requirements.

Austria has many important mineral resources. In Styria are some of the largest iron ore deposits in all Europe. Before 1939 Austria was the world's second supplier of Magnesite, Crude oil production started just prior to World War II. In 1944 Austria was already Europe's second largest oil producer. The entire oil production and refining is now under the Russians.

The Austrian economy is fundamentally industrial. Approximately 35% of the population is employed in industry and trade. Some figures of the Austrian industrial production (in metric tons) are as follows:

	1949
Pig Iron	837,748 or 215% of 1937 output
Steel	834,574 or 128% of 1937 output
Metalic Aluminum	14,797, or 336% of 1937 output
Rolled Steel	531,515 or 122% of 1937 output
Cement	1,098,367 or 256% of 1937 output

While the old Austro-Hungarian Empire represented a well-balanced, fairly self-sufficient economy, with the Austrian Republic

needs a considerable time to readjust their economy. By 1937 this was near completion, however, Austria had to import 25-30% of their food requirements. In addition they had to import the industrial raw materials. In 1949 the total exports were 3,229 million shillings; the total imports were 6,344 million shillings. This shows how important it is for Austria to increase their export.

The post war survival of Austria was possible only through U.S.A. help. UNRRA sent 137 million dollars worth of goods to Austria. The interior aid program consisted of 57 millions of dollars. A 13 million dollar credit was secured from the Export Import Bank. Approximately 11 million pounds sterling was secured from England. ERP gave from April 1, 1948 until June 30, 1949, 219 million dollars in direct aid, and 63.5 millions in drawing rights. In the second year of the Marshall Plan, Austria received 166.4 million dollars and 83.1 million drawing rights. Austria was passive in their statehold from 1919 until 1938; and after 1945 they were able to survive only with the support of the Western World. This was not the fault of the Austrians. Their struggle for the improvement of their foreign trade balance has inspired the admiration and respect of other nations. The Austrians have known for a long time that hydro-power export is the main item which would make their economy sound. They already had in 1922 the Illwerke for power export to Germany.

The power situation throughout Western Europe made France, Germany, Italy and Switzerland very much interested in Austrian hydropower, Multilateral negotiations resulted.

Under the ERP program, the Austrian water power resources in Tyrol and Vorlorlberg are expected to be run as electric power centers for Western Europe.

The main problem was to harness the energy of the falling water in such a way, that it would give sufficient power at any time of the year.

Negotiations went on with all interested countries. Projects were rushed to completion. Construction of Kaprun started, with ERP help, which when finished will be 300,000 KW, the largest generating hydro station in Europe. As a result of all negotiations the Studiengesellschaft Fur Alpen Wasserkrafte in Osterreich (Interalpen) (Study Company for the development of Alpine Water Power in Austria, Ltd.) was founded in December 1,1952. Partners are:

Germany: Deutsche Verbundgesellschaft, Heidelberg

France: Electricite de France, E. d. F., Paris

Italy: Societa Energia Elettrica (Senel), Roma

Austria: Osterreichische Elektrizitatswirtschafts A.G. (Verbundgesellschaft), Vienna.

All four countries nominated their top men for assignment to this study company, and the following is a digest of the reports submitted.

1) Germany and the Austrian Alpine Water Powers

In 1951 Belgium, Germany, France, Italy, Luxembourg, Netherlands, Austria, and Switzerland produced 150 billion KWH, of which 50% came from hydro power plants. Germany alone producted 50 billion KWH, of which only 9 billion KWH (18%) was from hydro plants. As Germany expects in the next 10 years to double its power production, this relation of hydro power to thermal power will be worse. However as the power consumption continues to grow, the coal production does not keep pace with it.

Therefore, Germany has to look for other power sources. For Germany the best solution is the further development of the Austrian hydro-sources, which the Germans started to tap in 1922. From the technical and economical points of view, the most favorable is to erect large storage-plants, the most important function of which should be the regulation of frequency. In this way, the coal consumption of the thermal plants could be reduced. The storage plants would have at lease 20% of the maximum load, also including a certain reserve. As a result of this, there exists today the Vorarlberger ILL-Storage Plants, founded in 1922, with a present capacity of 360,000 KW. In addition the Achensee Plant with 72,000 KW was built, which supplies 200 million KWH in a normal year.

It is apparent that Tyrol will be the junction of the future European Grid with the following important functions: (1) to transport the energy produced by plants to be constructed in Tyrol: (2) to connect the respective networks. The German part of the European Grid will be a 380,000 V. ring-system connecting the northern and southern areas. Three additional branches will have to be built: first the territory of the upper Rhine in Switzerland; the second to Vorarlberg; and the third to Tyrol. The Austrian Grid also has to be extended to Vorarlberg with a new 220,000 V. line. The Study Company will have to arrive at a mutual agreement as to which projects are the best for overall interests, as well as create the means for financing these projects. The Study Company will clear all legal questions involved, as well as develop a financial program. The international capital market will be interested in investments only if a new enterprise is founded on an international basis, not subject to national legislation.

This will require special treaties between individual states. The Study Company will be a center for European thinking and will be concerned with the important field of energy economy. The Germans seem to be ready to give their full cooperation.

2) Power Exchange Between France and its Neighbor Countries and the possibilities of electric economy relation between France andAustria.

Prior to the Second World War, the following power exchange existed for France:

Switzerland supplied up to 500 million KWH yearly, this supply being diminished considerably since 1939.

Power exchange existed with Germany up to 500 million KWH yearly.

Power exchange existed between the French and Belgian Luxenburg steel works up to 50 million KWH yearly.

No power connection with Italy and Spain existed.

Since 1945 there has been a trend in France to conclude new agreements of this kind. The following have been built within the last four years:

The new 220,000 V. and on 150,000 V. transmission lines with Germany.

A 220,000 V. and two 150,000 KV line with Italy.

A 110 KV line with Spain.

A 150 KV line with Belgium

A 150 KV transmission line with Switzerland.

A 220 KV France-Switzerland line and a 220 KV France-Spain line are planned.

Besides all of the above E.d.F. and the British Electricity Authority have studied the possibilities of an undersea cable connection between France and England.

The Negotiations between France and her neighbors are as follows:

Switzerland With the new construction of large storage plants, Switzerland is now also able to supply winter-peak power but is looking for power for its own overall-peak, and for low load periods in winter. Switzerland has built over 60% of its hydro potential and the Swiss are therefore reluctant to assume large power-supply obligations, in order to avoid trouble with their own power demand. France now takes 300 million KWH yearly (against 400 to 500 KWH in 1939). The French export to Switzerland is growing.

There is only a limited power exchange with Italy (limited at least for the time being).

There are two agreements with Germany between E.d.F. and RWE respectively and Badenwerk.

There is a power exchange with Belgium which is confined exclusively to thermal power.

An agreement with Spain is justified, as the water conditions are entirely different in France and Spain. Besides this, Spain is ppor on coal.

The power exchange between France and its neighbors represents only a small part of the French power economy. It is however, of great importance, as it compensates in imports for power deficits. As France does not have a direct border with Austria, an exchange between them will have to interest either Germany, Switzerland or Italy. As it is easier to establish a power exchange agreemtne between two countries than between three or four, it will be necessary for France first to conclude such an agreement with one of these three nations. It will then be easier to conclude an agreement with Austria.

The connecting transmission lines would be so planned, that they would carry all energy transports and "couplings". The plan might also take into consideration power transfers, whichever is soundest economically and technically feasible. As many French think that such a power transfer from Austria would be too expensive for France, it is necessary that the Austrian hydroplants be constructed so economically that they will cover this price gap. If the above is done properly, huge power quantities could be supplied from Austria to France. Of course, the Austrain plants have to be built first, but Austria needs substantial financial help to be able to carry through this program.

France E.d.F. would be interested in such a development of load shifting, and is willing to cooperate in the Study Company. But to participate financially in these Austrian projects, France's possibilities are very limited. France cannot do it at the expense of its own program. France might agree to buy a part of the power to be produced. With such an obligation, in coordination with its own power projects, France would not harm its own interests. But for the financing of this Austrian development, the French expect a loan to Austria from some international money source. A chart of France's imports and exports of power for 1951-1952 is as follows:

France	Exports	Imports (in millions of KWH)
1951	620	590
1952	530	580

ITALY

In Italy only the Alpine hydropower sources are suitable for development. Italy, poor on coal, has done its best to develop its

sources of hydropowers. In 1952 the total hydropower was 7,500,000 KW. In 1952 the total power produced by thermal plants, including the geothermical plants, was only 970,000 KW. As Italy has utilized 52% of its hydro power, and the balance cannot be developed economically.

Italy is naturally very interested in the Austrian hydro developments.

THE AUSTRIAN ALPINE HYDROPOWER PLANTS

It is estimated that the economically sound and technically acceptable Alpine water power sources of Austria could supply 30 billion KWH yearly. Approximately 8 billion are developed, or under construction, and general projects call for 24 billion KWH. The construction of the Austrian hydro plants would incur higher expenses and would cause more difficulties than those in Scandinavia. This is due to mountain foundations, and to the difference in water quantities in the different seasons of the year. The great advantage, which outweighs this disadvantage, is Austria's central location in Europe. The projects which are negotiated in Interalpin are:

1) The Project Bregenzer Ach. (incl. the diversions of Lech and Breitach Rivers) with 403,000 KW; Yearly 1258 million KWH.

2) The Inn River Project

With 424,000 KW, average yearly 2,492 million KWH production.

3) The Otz Project Capacity

Capacity 1,041,000 KW: Yearly 2,190 million KWH.

4) The East Tyral (Osttirol) Project

Capacity 430,000 KW; Yearly 1,207 million KWH.

5) The Danube-Jochenstein Project

Capacity, 140,000 KW yearly production 920 million KWH.

These are the Austrian projects which could be used for international service without damage to Austria's own power economy. These projects are mainly discussed by the Study Company. All these projects demand large investments. Austria does not have the funds, nor does France, Germany and Italy, nor are these other nations willing to invest such amounts in Austria. For a part of this investment Austria opened the first post war private investment subscription for the hydro-electric power plant development loan. The total amount was not stated but it should be around 15 million dollars. This subscription started May 26th.

Director Dr. Rudolph Stahl of the Austrian Verbundgesellschaft will come in September to the U.S.A. to negotiate with the World Bank for a loan of approximately 250,000,000 schillings.

A conditional agreement with Italy was signed by Austria, calling for the supply of 80 million KWH of electric power the lire proceeds from which are to be used for repayment of this loan to the World Bank.

Austria increased its own power consumption from 1938 to 1951 by 100%. This was possible only through the U.S.A. help through the Marshall Plan and the ERP.

Each country is endeavoring to raise the necessary capital itself. But apart from Switzerland, none of the Western European countries can possibly do so.

The chances for success in securing such loans undoubtedly depend on, and will be greatly strengthened by, the number of major nations, in need of further development, which are involved in the negotiations. The rest of the Western European countries have built up their hydropower developments, and now Austria has more economical

sounder and cheaper power projects than the others.

It is to be expected that the countries, to be power-customers of Austria, will take part in the financing. But, simultaneously they will undoubtedly insist that orders for at least a part of the necessary equipment be placed with their electrical industries. It is also to be expected that the required loans from the U.S.A. will have to cover the expenses of the constructions work. The European industries will jealously safeguard all equipment orders for themselves. For the U.S. electrical industry, there would be a chance to secure orders for at least a part of the equipment, only if the loan granted is given to Austria on the condition that orders for a certain portion of the equipment must be placed with U.S. manufacturers.

YUGOSLAV HYDROPOWER IN THE WESTERN EUROPEAN POWER GRID

The OEEC expects a 40% increase, which is from 248 to 347 billion KWH annually in Western European power production. However, this is still not sufficient to cover the rapidly growing need.

The most important source of this missing power is Austria, with their Alpine hydropower plants, about which we have given a detailed report in the first part of our paper. We do not wish to go into particulars about the relatively high cost of those developments, which are often built at 6000 feet altitude. However, we wish to emphasize the big disadvantage of the winter shortage in power at all those plants (similar to Switzerland). Winter is the part of the year when all countries need the most power. The Austrians are aware of this problem, and are looking to the combination of the straight Alpine character plants with plants on the Danube. This is shown by the data published by the Austrians themselves.

The official Austrian publication: "Austria's Hydro-Power Resources and their utilization for European Power Supply", states on page 23: "The Danube has the most regular water flow of all rivers in Austria and this results in a rather favorable seasonal distribution of the power output. It is expected that 44% of the total power production will be generated in winter and 56% in summer, while in the case of Alpine Rivers, the water supply yields not more than one third of the annual power production in winter". This situation is so critical that OEEC and Germany, Italy and Greece (an independent separate affair) became interested in the possibility of utilizing Yugoslav hydropower sources, especially those on the Dalmatian coast. They have done this, despite the fact that the present Yugoslav government, which broke

away from Russia in 1948 and is now looking to the Western World to help them survive, is communistic. While the present government exists in Yugoslavia it is politically difficult to include Yugoslavia in the Western European family, and there is no outlook for a change soon. The fact that certain Western European nations are definitely interested in the Yugoslav power sources, despite this important political factor, is positive proof of the need of a supplementary power source, in addition to the Austrian development.

The Yugoslavs claim (with what degree of justification we do not know) that the Austrians have not invited them to the foundation of the Study Company, in order to prevent a discussion of the advantages of the Yugoslav hydropower resources. We personally do not believe this, as any caution and reluctance on the part of Austria towards the proposal that the Yugoslav hydro developments be united to the Austrian system are fully justified for technical reasons.

Other Western European countries regard this matter differently. They expect U.S.A. financing for the Yugoslav development, and they would like to have their own industries supply the equipment which will be required. The Yugoslavs wrote in their "Review of International Affairs" Volumn IV, number 8, dated March 1, 1953, pp. 19 and 20 the following:

> "Who would finance the construction of these power plants? The simplest way should be American assistance. However, other European states could also take part in this financing although on a smaller scale, especially Western Germany and Italy, either by supplying equipment directly through an action of

International Bank for Reconstruction and Development, enabling Yugoslavia to pay off the loan by exporting electric power".

We wonder if any of the Western European countries would finance such a long range investment without the full guarantee of the U.S.A.? Yugoslavia has the natural hydro power sources, and according to the optimistic Yugoslav estimate it will be around 50 billion KWH yearly. A more realistic appraisal will be available from the report of a U.N. "Technical Assistance" expert, Mr. Karpov, who is returning from Yugoslavia after a 7 month survey. It is a known fact that substantional hydropower sources exist in Yugoslavia. We would disregard those on the river Danube as they are on the Rumanian border. It is true that the sources in the central territories of Yugoslavia have disadvantages in winter which are similar to thos in Austria, but conditions in Yugoslavia are not as severe as in the high Alps of Austria. The Yugoslavs are developing their hydro power plants mainly for their own use. According to Yugoslav published data the following hydro-plants will be started in construction in 1953 (these statements have to be taken with reserve, as they serve for domestic propaganda, and experience shows that such programs are in reality carried through on a much smaller scale than originally stated.)

1) Crvena Voda on the river Drina 130,000 KW yearly production 630 million KWH.

2) Rama on the river Neretva 160,000 KW yearly production 500 million KWH.

3) Kokin Brod on the river Lima 146,000 KW yearly production 395 million KWH.

4) Vuhred on the river Drava 60,000 KW yearly production 394 million KWH.

5) Krsko on the river Sava 19,000 KW yearly production 160 million KWH.

6) Gojak on the rivers Dobra-Krezice 42,000 KW yearly production 190 million KWH.

7) Peruca on the river Cetina 15,000 KW yearly production 65 million KWH.

8) Vardar on the river Vardar 50,000 KW yearly production 250 million KWH.

9) Vrla IV on the river Vlasina 22,400 KW yearly production 55 million KWH.

Total 644,000 KW 2,619 million KWH

Plants #1,3,9 are in Srbija; 2,7 in Dalmatia; 4,5,6 in Slovenia; 8 in Makedonija.

Crvena Voda and Kokin Brod belong to the Drina system which ultimately could be, including the Drina tributories, 1,500,000 KW.

Rama belongs to the Neretva system which will be 560,000 KW; Vuhred belongs to the Drava river where 111,000 KW is already in operation. The final capacity could be around 1 million KW. Krsko and Gojak belongs to the Sava river system, which has an ultimate capacity of 923,000 KW; Peruca belongs to the Cetina, which has an ultimate capacity of 795,000 KW.

For the Western European Grid, as a supplement to the Austrian system, particularly in winter, the Dalmation hydro sources

are the most important. The Dalmatian hinterland has an average rainfall of 1,500 to 2000 milimeters yearly; which goes up to 3000 mm in certain districts. This territory has the maximum production capacity in winter.

The foregoing explains why the Western European Countries are very much interested in the Yugoslav hydro developments.

OEEC has also shown interest. Yugoslavia, Austria, Germany and Italy appointed four committees to study the feasability of developing Yugoslavia's hydroelectric power for export to Central Europe. The technical committee will be headed by a Yugoslav; the financial group by an Austrian; the juridical group by an Italian; and the economical group by a German. A coordination committee composing the four Committee Chairman, with the chief of the Electric Power Section of OEEC as its chairman, are meeting in June and July to examine what has been accomplised. French and Swiss experts will also attend this meeting. The Yugoslavs have in mind the Split hydro project on the Cetina river. The initial Yugoslav project has four 100,000 KW units. As such large units of 100,000 KW are not manufactured in Europe, this would give us an excellent chance - if the financing will permit the purchase of this equipment in the U.S.A. The only difficulty might be that the speed required may be higher than Pittsburgh is willing to accept for such generators. Even so this project would still be attractive as regards switchgear and equipment for transmission lines of 2 minimum length of 400 kilometers (250 miles) at 220,000 volts. All of course, if we do not have European competition.

THE COUNTRIES BEHIND THE IRON CURTAIN

In analyzing the Western European power cooperation, particularly Austria's participation in power supply, the power sources and power requirements of the countries behind the Iron Curtain should not be forgotten. If those countries could again exist as free countries, free members of the European family, they would be important members of the all-European power grid. Due to the communistic domination of these countries, they are naturally not permitted to join any Western European capitalistic organization, and their developments are kept secret from the Western World.

How much of the data listed below is the truth, and how complete it is no-one knows. However the data are very interesting. All countries behind the Iron Curtain, with the exception of Eastern Germany, are considerably behind those in Western Europe in electric power. Their thermal and hydro resources, on the whole, are about equal with those of Western Europe. According to Prof. H. Herbich, quoted by S. Rotarski (in the Unexploited Resources of Europe "IN EASTERN QUARTERLY", London January 1950) the Danube has excluding Germany and Austria 17 million KW (from this the Iron Gate alone has 5 million KW belonging to Yugoslavia and Rumania) and other rivers around 3 million KW. In Eastern Germany the plants are Niederwartha and Hohenwartha which are completely built up. In Czechoslovakia the Slapy Plant on Vltava River was completed in 1950, and another at Nosice in Slovakia, Plans are made for a hydroplant of 500,000 KW

at Komarno on the Danube River. A second hydroplant is planned on Vltava River at Prague. In Hungary a large hydroplant has been completed at Tiszalok on Tisza River. In Poland, the Dychow Plant on Bober River went into production in 1951. In Bulgaria two medium size hydroplants were completed in 1951 on the Maritsa River.

Large steam plants are preferred, as they can be constructed in less time then the hydroplants. Some of these are: Elbe (288,00 KW); Drattendorf (450,000 KW); Bergdore (150,000 KW) are in Germany; Czechoslavakia has the most Plant (350,000 KW) and many others; and Czechoslavakia also expects from 1950 to 1955 to increase their capacity by 2,782,000 KW. Overall, there seem to be 15 plants in construction with at least over 100,000 KW each, while some are as big as 450,000 KW. All new thermal plants will work on lignite, low grade coal, and coal waste. The following table shows the developments behind the Iron Curtain;

	1930	1943	1949	Planned
	in Millions of KWH			
Bulgaria	95	340	815	1,800
Czechoslovakia	2,993	6,600	7,514	16,500
Eastern Germany	10,000	27,000	16,500	33,414
Hungary	715	1,806	2,200	6,000
Poland	2,906		8,146	19,300
Rumania	550	1,271	2,500	4,700
Total	17,259		37,675	81,700

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